

## A Simple Humidity Chamber for Maintaining Subterranean Termites (Isoptera: Rhinotermitidae) in the Laboratory

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*Abstract.*—A simple and inexpensive apparatus for establishing the high humidity necessary to rear *Reticulitermes hesperus* Banks in the laboratory is described. This humidity chamber permits soil-free culture and could be used with other subterranean termite species. This technique could also be modified for use with other insects requiring specific humidity conditions.

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Various techniques have been described for maintaining cultures of *Reticulitermes* species (Isoptera: Rhinotermitidae) in the laboratory. Most of these techniques require soil or some other tunneling substrate to retain moisture (Hendee, 1937; Adamson, 1941; Strickland, 1950; Haverty, 1979; Smith, 1979). However, soil-free culture is advantageous when individual termites must be removed from rearing containers frequently for biological assays, and also facilitates observations of group behavior. Pence (1957) describes a method using plaster in place of soil to retain moisture. This permits ready observation, but the apparatus is designed for long-term maintenance and individual termites are not easily removed.

I describe here a simple and inexpensive method of maintaining western subterranean termites, *Reticulitermes hesperus* Banks, in the laboratory. This technique satisfies their high moisture requirement (Williams, 1934; Pence, 1957) in soil-free culture. Individuals can easily be removed from rearing boxes with a hand aspirator.

### MATERIALS AND METHODS

Subterranean termites can be collected either in traps (La Fage et al., 1983) or by dissecting infested wood. In our laboratory, infested wood is cut into small blocks and termites dislodged from their galleries by tapping the wood. Dislodged individuals and those removed from infested soil with an aspirator attached to a small vacuum pump are placed in clear plastic boxes (ca. 30 × 19 × 10 cm). These boxes were originally sold for storing shoes. Each box is provided with a small piece of the wood from which the termites were collected, Whatman No. 1 filter paper, and a small piece of damp cotton. The damp cotton is a source of moisture while the box is open during the collection process. These boxes, each containing a maximum of ca. 3000 termites, are then placed open (without lids) in a humidity chamber.

The humidity chamber is a rectangular (ca. 36 × 30 × 80 cm) 32-gallon polyethylene refuse container containing 10–15 liters of water. Refuse containers such as Sears Permanex 6 in which the lid slides down over the rim (friction-fit) provide

a better seal than those in which the handles move to lock the lid in place. Termite rearing boxes are placed on stackable plastic storage shelves (such as Rubbermaid No. 2340). Approximately 7 cm must be sawn off one end of each shelf for it to fit into the refuse container. Each refuse container easily holds four stacked shelves, thus housing up to four rearing boxes (ca. 12,000 termites).

#### RESULTS AND DISCUSSION

Humidity within the chamber can be monitored with a small hygrothermograph or with a direct-reading membrane hygrometer such as those manufactured by Bacharach, Inc. With our laboratory temperatures of 21–25°C, a nearly saturated atmosphere ( $94 \pm 5\%$  RH) is maintained within the chamber. Although high humidity is desirable for subterranean termite survival, lower humidity regimes could also be established with salt solutions (cf. Peterson, 1964; Winston and Bates, 1960).

Whatman No. 1 filter paper is our standard feeding substrate and is added as needed to the rearing boxes. No decline in activity or survival has been noted in groups kept in the laboratory for over three years. A diet such as that described by Mauldin and Rich (1975) could also be used in lieu of filter paper.

In addition to its use as a rearing container, this humidity chamber is also appropriate for use in feeding assays, since it eliminates the need to add water periodically to the experimental units (petri dishes, etc.). As noted by Haverty (1979) opening these containers to replenish the water is disturbing and can cause some termite mortality. In our laboratory, petri dishes or 30 ml plastic cups containing termites and the substrate of interest are placed in the humidity chamber and left undisturbed for the duration of the test. This technique has been employed to assess termite survival in alpha-cellulose and various sawdusts (unpublished), and to assay feeding on rice papers suspected of antifeedant activity (Grace et al., 1986).

Although designed for subterranean termite maintenance, this method of humidity control has also been successfully adapted in our laboratory to rear bark beetles and may prove useful with other insects as well.

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#### LITERATURE CITED

- Adamson, A. M. 1941. Laboratory technique for the study of living termites. *Ecology*, 22:411–414.
- Grace, J. K., I. Kubo, and S. E. Lindow. 1986. Measurement of termite (Isoptera: Rhinotermitidae) feeding on paper by video image analysis. *J. Entomol. Sci.*, 21:10–15.
- Haverty, M. I. 1979. Selection of tunneling substrates for laboratory studies with three subterranean termite species. *Sociobiology*, 4:315–320.
- Hendee, E. C. 1937. Laboratory colonies of termites. Pp. 275–279 in *Culture methods for invertebrate animals*. Comstock Publ. Co., Ithaca.
- La Fage, J. P., N.-Y. Su, M. J. Jones, and G. R. Esenther. 1983. A rapid method for collecting large numbers of subterranean termites from wood. *Sociobiology*, 7:305–309.
- Mauldin, J. K., and N. M. Rich. 1975. Rearing two subterranean termites, *Reticulitermes flavipes* and *Coptotermes formosanus*, on artificial diets. *Ann. Entomol. Soc. Am.*, 68:454–456.

- Pence, R. J. 1957. The prolonged maintenance of the western subterranean termite in the laboratory with moisture gradient tubes. *J. Econ. Entomol.*, 50:238–240.
- Peterson, A. 1964. *Entomological techniques*. Edwards Bros., Ann Arbor.
- Smith, V. K. 1979. Improved techniques designed for screening candidate termiticides on soil in the laboratory. *J. Econ. Entomol.*, 72:877–879.
- Strickland, M. J. 1950. Differences in toleration of drying between species of termites (*Reticulitermes*). *Ecology*, 31:373–385.
- Williams, O. L. 1934. Some factors limiting the distribution of termites. Pp. 42–49 in C. A. Kofoid (ed.), *Termites and termite control*. Univ. Calif. Press, Berkeley.
- Winston, P. W., and D. H. Bates. 1960. Saturated solutions for the control of humidity in biological research. *Ecology*, 41:232–237.